

Item-numbers:

68010.200

68010.304

68010.308

68010.312

68010.204

68010.208

68010.212

68010.230

68010.240

68010.348



HPS-C-S Hotrunner Controllers

Operating manual for multi-zone controllers

Valid for all controllers
from software version 2.00

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Safety information

Before working on the plant, you must ensure that it is safely isolated from the voltage supply. Turn the equipment switch OFF and remove the mains plug. Connection, repair and maintenance works may only be carried out by qualified personnel.

Before commissioning the plant must be checked in accordance with EN 60204 - 06:2007 and the recognised rules of sound engineering. High temperatures arise at the connected components. Relevant precautionary measures are to be taken on commissioning or rather during operation.

Application:

This control system from EWIKON can be used to operate EWIKON hotrunner systems in dry industrial rooms.

EWIKON HPS-C - The features

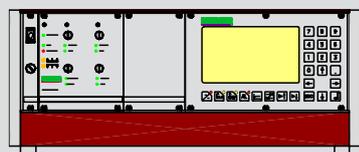
- **Adaptive PID control** with self-optimisation, manual fine-tuning possible
- **Heating current monitoring** in 230 V operation, current control in 5 V operation
- **Ramps function** for temperature, current or percentage manipulated variable
- **Intelligent start up function**, measurement of the leakage current:
Drying out only takes place for detected leakage current;
otherwise the set temperature is started up directly.
- **Increase function** (time limited) for heating the control zones after starting up,
manually or via external contact
- **Decrease function**, manually or via external contact
- **Two possible modes in case of sensor failure:**
manual mode and master mode from another zone
- **Safety function:** option of switching off the zone or the whole system if errors are detected
- **Monitoring and alarm functions** for sensors, load and process values
- Output: power controllers work in **phase angle control mode (5 V)** or in **pulse package mode (230 V)**.
In the drying out phase in 230 V operation, also works in phase angle control mode for more gentle heating
- **Standard CANopen interface** therefore can also be extended using third party modules.
For example, communications are possible with the injection molding machine controls.
- **Multi-lingual display** (switch-selectable)

EWIKON HPS-C - Overview of devices

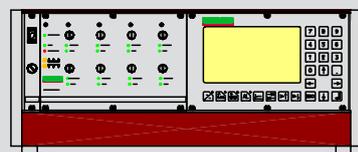
Controllers for 230 V hotrunner systems



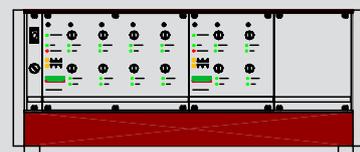
Operating unit
Item No.: 68010.200



4-zone controller
Item No.: 68010.304



8-zone controller
Item No.: 68010.308

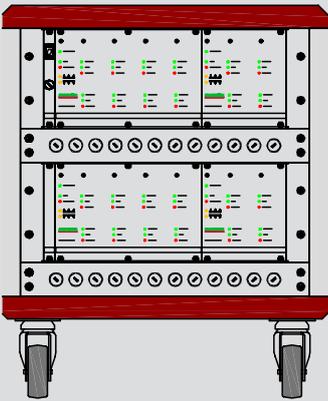


12-zone controller
Item No.: 68010.312

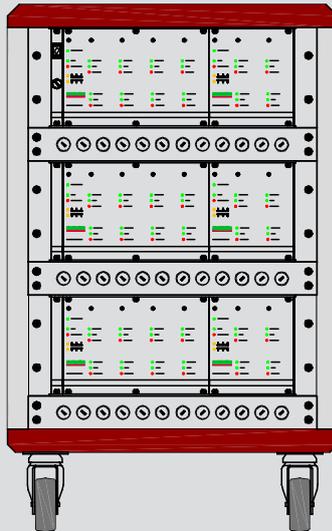
Controllers with increased output power (3.5 KW) for 230 V systems



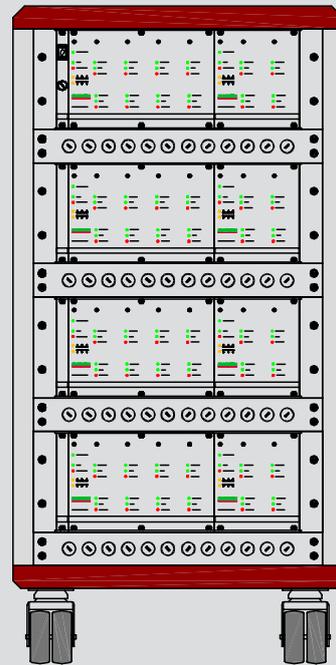
Operating unit
Item No.: 68010.200



24-zone controller
Item No.: 68010.230



36-zone controller
Item No.: 68010.240

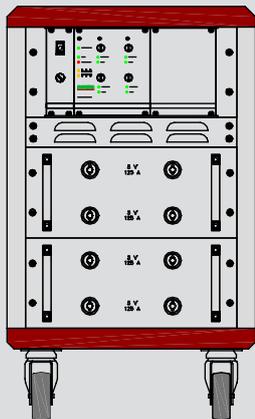


48-zone controller
Item No.: 68010.348

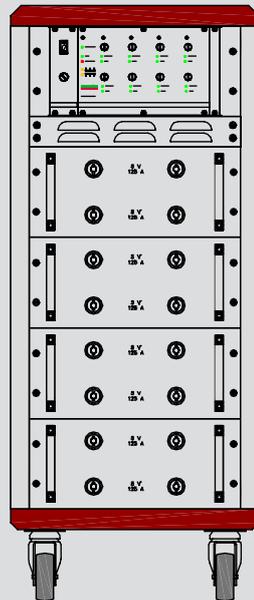
Controllers for 5 V or 230 V hotrunner systems



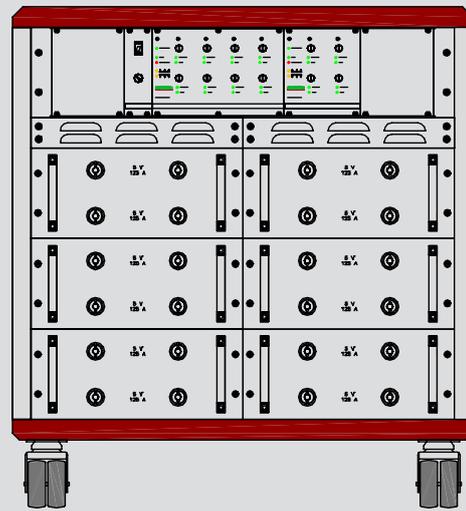
Operating unit
Item No.: 68010.200



4-zone controller
Item No.: 68010.204

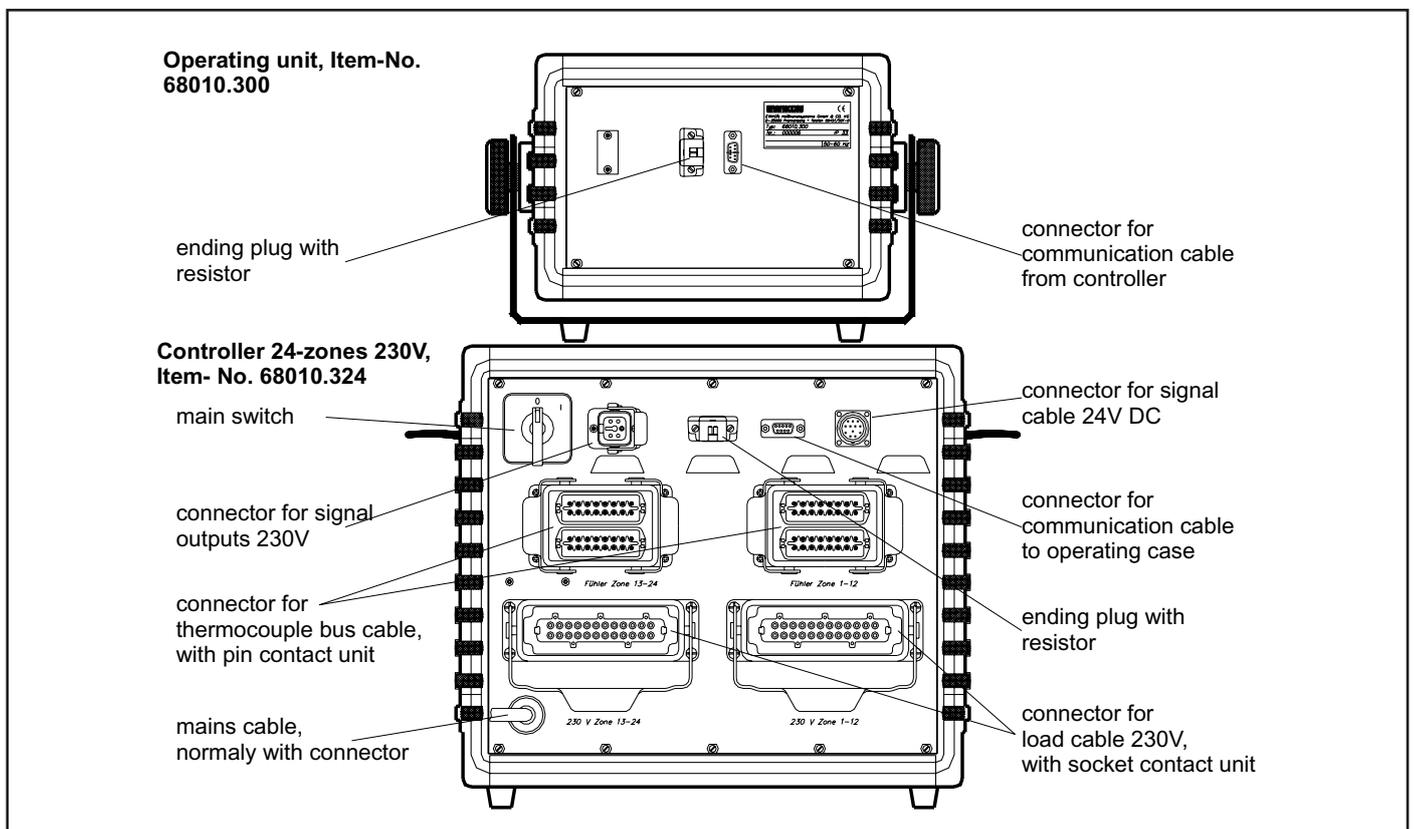
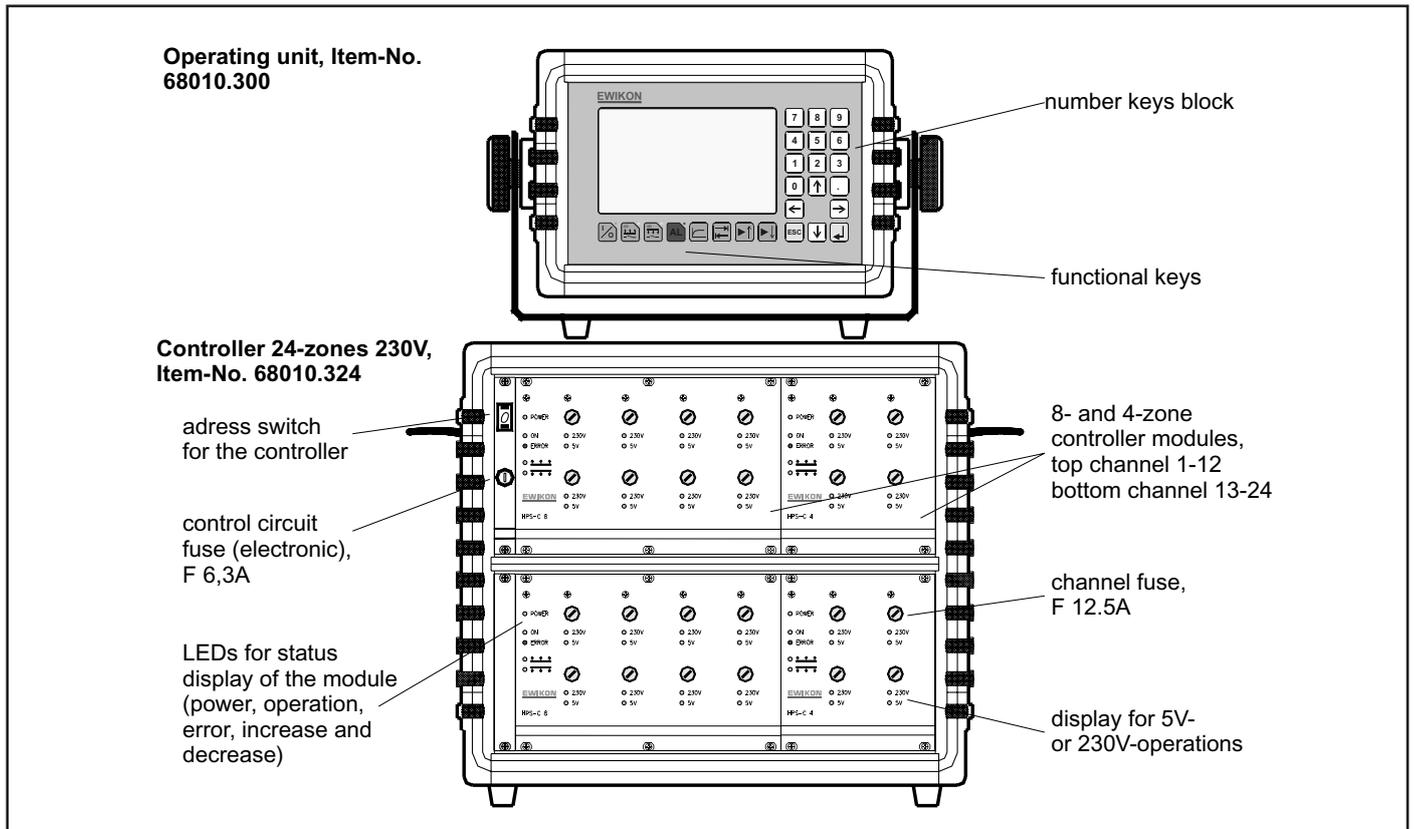


8-zone controller
Item No.: 68010.208



12-zone controller
Item No.: 68010.212

Connection and commissioning



The connectors on the left hand side show an example of a 24-zone controller 230V with external operating unit. On commissioning the control system, the following procedure should be adhered to, to avoid problems:

Connect communications cable to operating unit and to controller, except in the case of devices with an integrated operating unit. At the same time, ensure that the terminating resistor connector (actuator: Art. No. 18095 with pin contact unit; controller: Art. No. 18096 with socket contact unit) are fitted to the other connection points of the CAN interfaces plug.

Connect signal cable 24V DC, Art No. 60070.019, to the controller and the injection moulding machine controls, if integrated equipment functions (decrease, fault signals, ...) are required.

If necessary, connect additional 230 V signal devices to the controller socket provided.

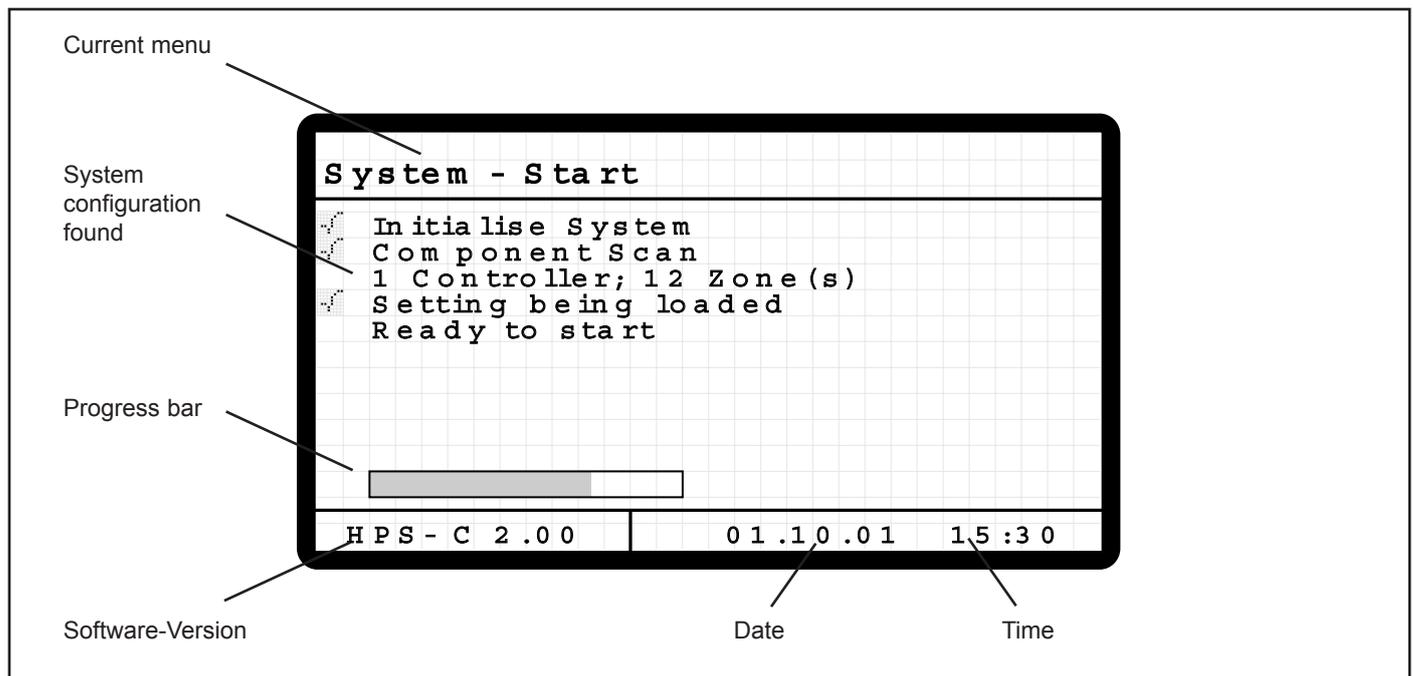
Plug in the controller mains plug. You must ensure that the supply voltage matches the data given on the controller rating plate!

Connect 230 V connection cable to the rear wall of the device and the tool or 5V connection cable to the front of the device and the tool. For 5V operations, connect the earthing cable to the tool and the controller too, the assignment is described in greater detail in the Chapter "Connector and Connection Assignment".

Connect the thermo-bus cable to the rear wall of the device and the tool.

Switch on the main switch on the rear wall of the device (in several models on the side wall too).

The following or similar then appears on the display (depending on the equipment configuration connected):



After switching on, the operating unit checks and displays the equipment configuration connected to the system bus. The settings last used are then loaded.

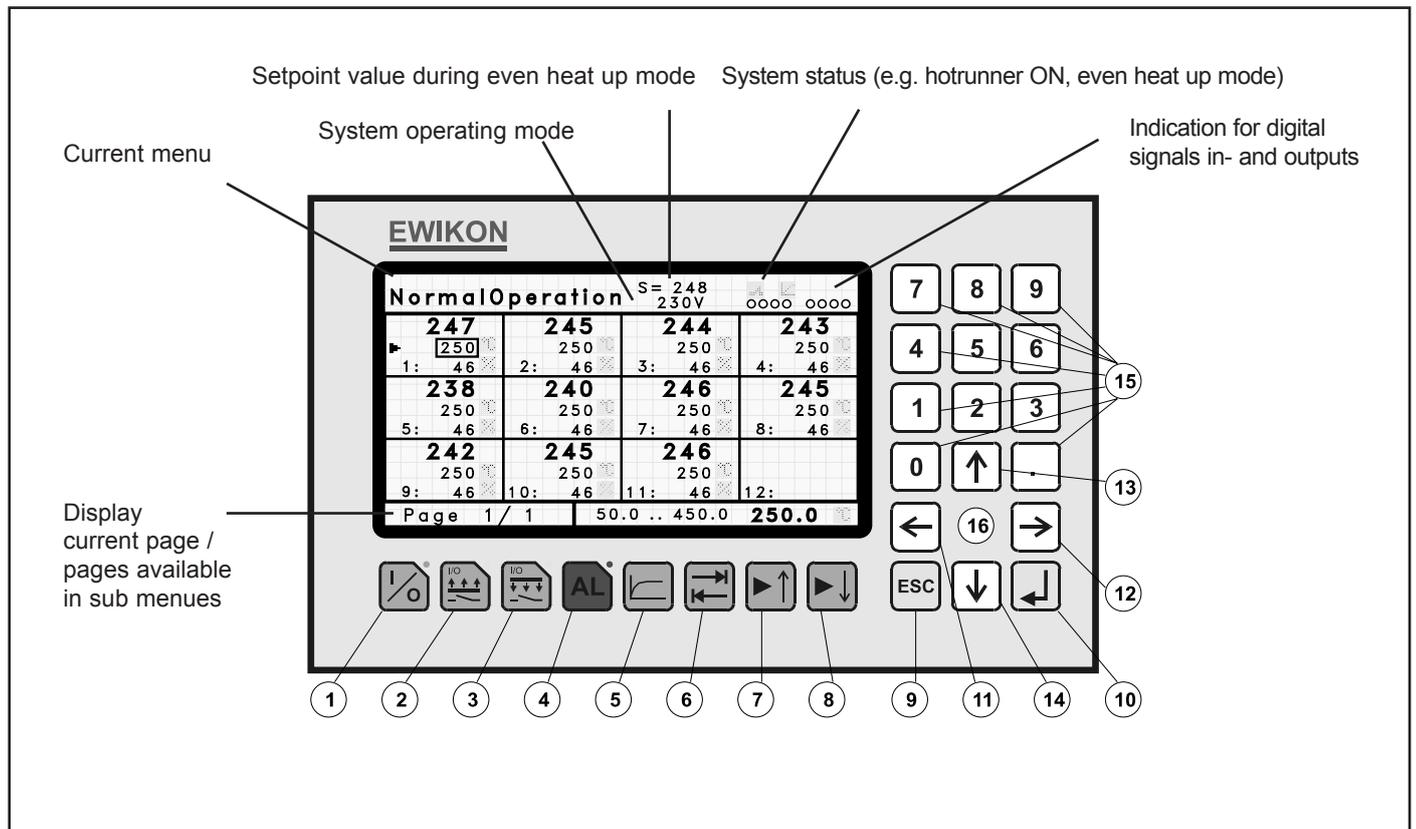
The following measures should be carried out if problems occur while loading the equipment configuration:

- If several control devices are connected to an operating unit, the mains voltage of the device directly connected to the operating unit must be switched on last.
- If several control devices are connected to an operating unit, the address switch of the controller must be set (from 0 to 3). The zones are assigned consecutively in the operating unit beginning with Device "0". Maximum 4 control devices can be connected to an operating unit, maximum 40 zones are supported.
- Check whether the respective terminating resistor connector is fitted to both ends of the BUS cable.
- Check whether the fuse for the first zone has triggered the unidentified module

Further operation of the system and value inputs are carried out in accordance with the following pages.

Display and operating elements

Display and keyboard arrangement



Various keys are available for operating the system, these are arranged in functional groups, and positioned around the display. The key functions are described in the following list.

Apart from the keys No. 1 (hotrunner ON/OFF), 2 (increase mode), 3 (decrease mode) and 4 (fault acknowledgement), a large display and 4 LEDs are available as display elements. The principal displays and the display design are shown in the figure above and are described in more detail in the following chapters.

Key functions

No.	Title	Function
1	I/O	Switch the hotrunner ON / OFF
2	Increase	Increase operation manual ON / OFF
3	Decrease	Decrease operation manual ON / OFF
4	Alarm	Alarm acknowledgement (reset error message)
5	Diagram	Switch to single zone / multi zone display in normal operation menu
6	Tabulator	Switch to next page (depending on sub-menu)
7	Page UP	Single zone display / select next zone
8	Page DOWN	Single zone display / select previous zone
9	ESC	Move back to previous menu or abort value input without saving
10	ENTER	Select menu or accept input value and save
11	Cursor LEFT	Moves cursor /input marking to the left
12	Cursor RIGHT	Moves cursor /input marking to the right
13	Cursor UP	Moves cursor /input marking up
14	Cursor DOWN	Moves cursor /input marking down
15	0 - 9, .	Value input or decimal point
16	Function key	Concealed key for additional (special) functions

Table of symbols

1) General symbols

System-Status	Channel displays	Parameter designations
 Hotrunner OFF	 Operating mode 5V (phase-angle-control)	 Type of load (slow - fast) (230V: 0 - 4; 5V: 5 - 9")
 Hotrunner ON	 Operating mode 230V (pulse-package-control)	 P-Component of the control-behaviour
 Increase operation ON	 Inc. values for temperature, current or power	 I-Component of the control-behaviour
 Decrease operation ON	 Dec. values for temperature, current or power	 D-Component of the control-behaviour
 System inactive	 Channel inactive	 Type of thermocouple (0 = K; 1 = J; 2 = L)
 System busy (save settings)	 Channel in temperature- control mode	 Channel for Master- control mode
 Softstart (Dry-out-mode)	 Channel in manual mode (5V)	 Measurement adjustment: lower measuring point
 Even-heat-up-mode	 Channel in manual mode (230V)	 Measurement adjustment: upper measuring point
 Self-optimisation process		 Measurement adjustment: new setpoint

2) Zone error display

	Thermocouple error detection	Diagnosis
 No Error or Warning	 open circuit	 Time-out error, target temperature not reached (heating power too small)
	 short circuit	 Leakage-current error, measuring value over limit (moisture in the heater)
	 polarity reversal (cross over + and -)	 Wiring error, temperature rise on other zone is recognized (display of zone-no.)
Toleranceband messages	Load error detection	
 Upper limit Error	 open load (or fuse)	
 Upper limit Warning	 short circuit	
 Lower limit Warning	 partial open load (1 of 2 heaters open)	
 Lower limit Error		

Operating the system

Introduction

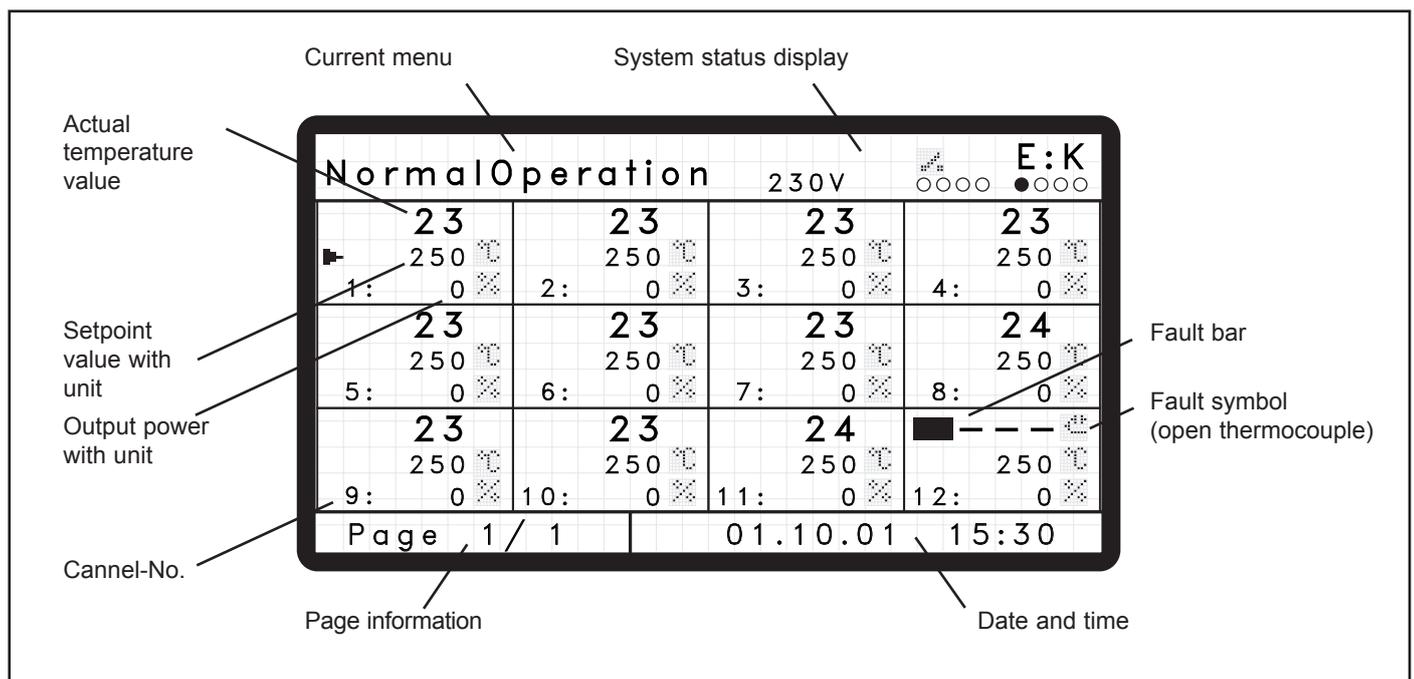
The HPS-C control system is operated in several menu levels, whereby the focal menu is the "Normal Mode" sub-menu. Therefore, after switching on the supply voltage the multi-zone display from this sub-menu is shown, if the control system has been correctly configured all operations can be carried out from here. The higher-level menu level (the main menu) is called up using the "ESC" key, sub-menus are selected in the main menu using the cursor keys and activated with the "ENTER" key. The various menus are described in detail in the following sections.

The values are entered using the number keys to the right of the display, the four cursor keys arranged beneath these are used to select the value, zone or menu item to be changed. The input is accepted with "ENTER" or aborted with "ESC". The function keys for frequently used commands or actions are positioned below the display, these are used to switch the hotrunner system ON or OFF, to switch the increase or decrease mode ON and OFF, or to acknowledge an error message.

The operating part display is divided into three areas, which are kept the same in all menus. The current menu and the system status is displayed in the top window, this guarantees an overview of the system status in all sub-menus. In the middle main window the display alters depending on the menu selected. The description is given in the respective sections. The bottom window is divided into two areas. The current page and the total number of pages available are displayed in the left-hand half of the sub-menus. The controller software can be read off in this position in the main window. The date and time are displayed in the right-hand side, while entering a value replaces this display with the input window. Apart from the current value, the input limits and the unit of the current value are also available as information in the input window as an input aid. The input mode is switched on using the "ENTER" key and switched back off with the "ESC" key.

Normal operation, Multi-zone display

After switching on the controller and completion of the initialisation, the overview display appears, the system is in normal operation. Depending on the equipment configuration connected, the following display, or similar, appears:



Up to 12 zones with the most important process data are displayed on one page, if more than 12 zones are connected the number of available pages can be identified in the bottom left-hand side of the display. These can then be paged through zone-wise or line-wise using the cursor keys or page-wise using the "Tabulator" key.

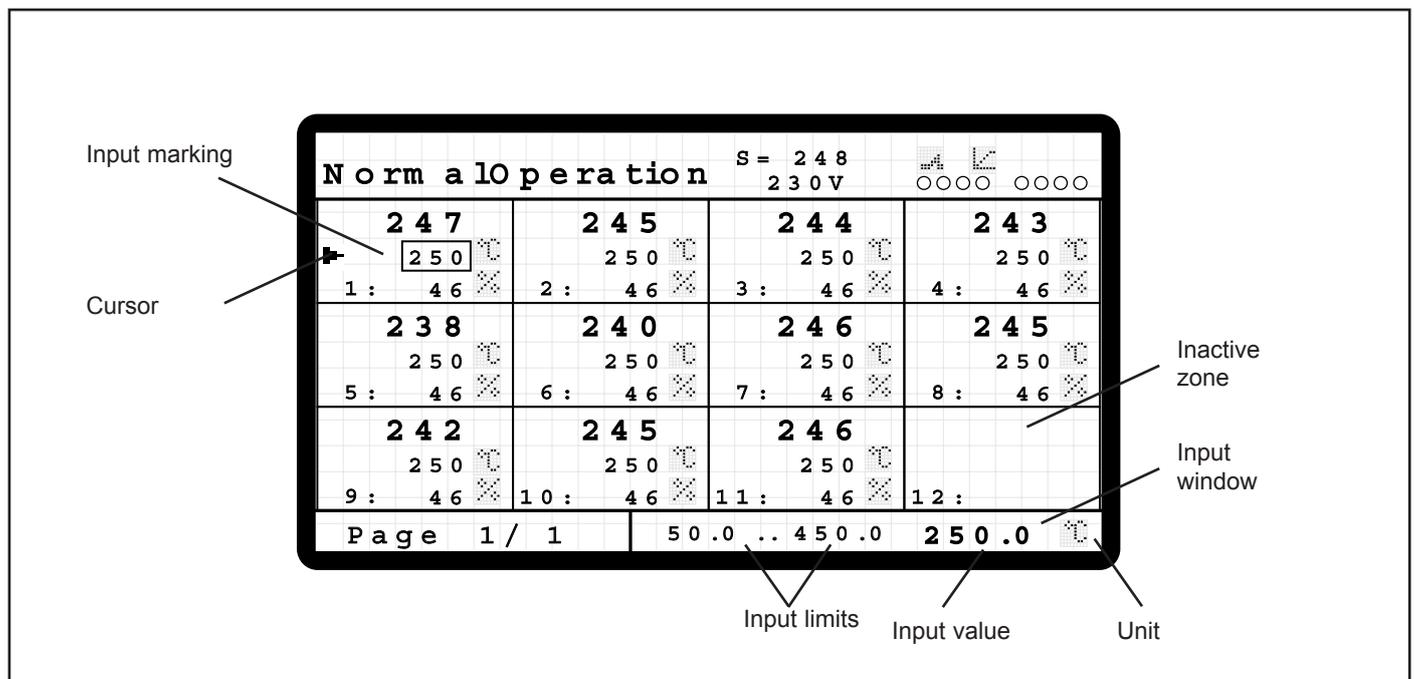
The zones are displayed as a "single window", the number of the zone can be seen in the bottom left-hand side of the window. The actual temperature value, the setpoint values of the current operating mode (°C = temperature control mode, A = 5V control mode, % = 230V control mode) and the current output power (A = 5V control mode, % = 230V control mode) . If the temperature sensor is interrupted, three dashes "---" are displayed instead of the temperature value.

If zones are inactive, only the zone number is displayed, or if the temperature sensor is connected the actual temperature value too.

ATTENTION: In the delivered condition, all the controller's zones are switched inactive, the setpoint temperature is set at 150°C. Before commissioning, the required zones must be adjusted in the single zone display according to use.

Zones with a fault (Zone No. 12) are identified by a flashing fault bar in front of the actual temperature value, the identified fault is signalled behind this in the form of a symbol (See "Fault Messages"). This provides you with a rapid overview of the current process status.

The current setpoint values can be changed in the multi-zone display, to make these adjustments the input mode must be switched on using the "ENTER" key. The input window now appears in the bottom right-hand side of the display and the input marking appears around the setpoint value of the selected zone.



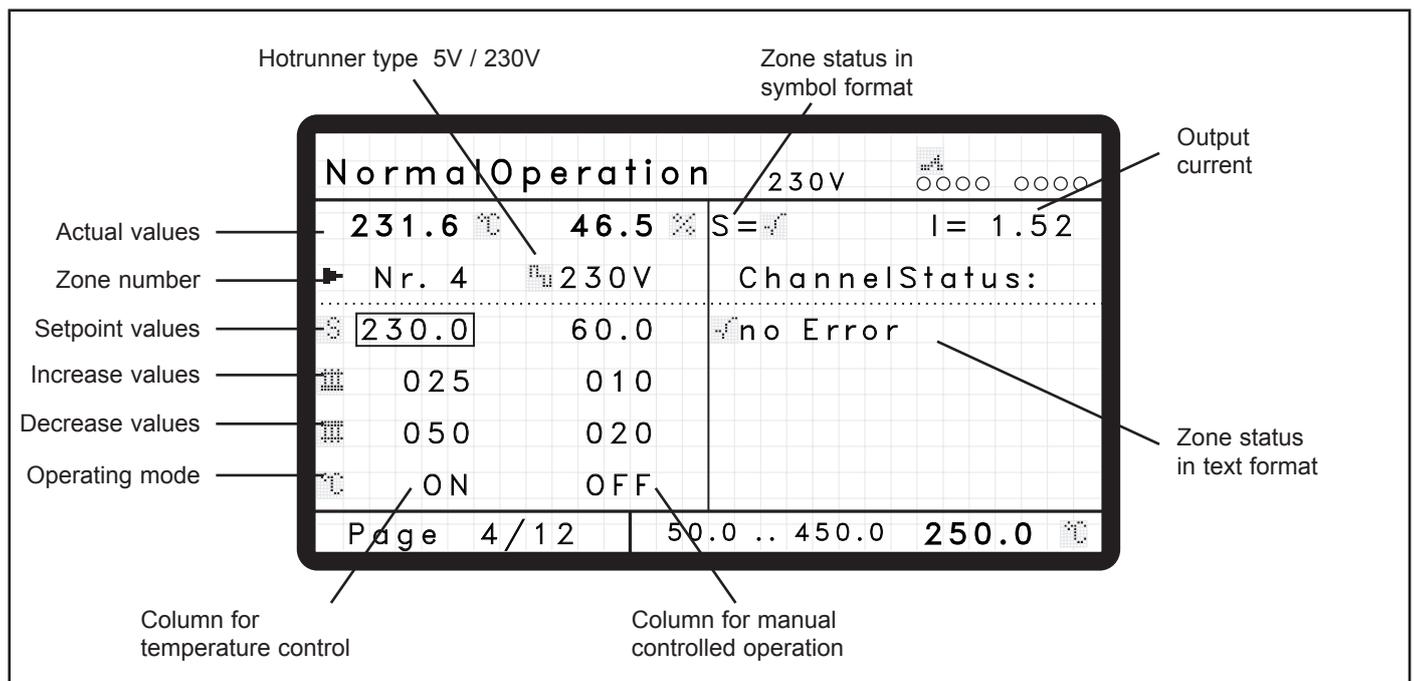
The zone for which the changes are to be made is selected using the cursor keys. The new value is entered using the number keys, and the value entered is accepted by pressing the "ENTER" key. Only then is the new setting effective. The input is ignored if an incorrect value is entered (value outside of the range) and the old value is retained. Incorrect values are signalled by the flashing of the display.

The last setting is retained when paging between the zones in the input window so that the new values can be quickly accepted for other zones too. An value entered can be aborted using the "ESC" key without the new setting being accepted.

If it is properly configured, the control system can be fully operated in the multi-zone display (switch on, switch off, increase, decrease, etc.), further adjustments can be made in the single zone display. The "Diagram" key is used to switch between the multi-zone and single zone display.

Normal operation, Single zone display

The controller's basic configuration for the respective application is carried out in the single zone display, where additional information about the zone status can also be read off. The main window is divided into two areas. The adjustment is made in the left-hand half of the screen and the information about the current status can read off in the right-hand half of the display. Even more adjustments can be made here in the deeper access levels, see the section on "Normal operation, extended functions".



The input mode must be switched on to enter values, the value which can be changed is identified by the input marking. The value is selected using the cursor keys.

The zone's actual temperature and output power are displayed in the top area, below this the selected zone number and the hotrunner type set (0=5V, 1 = 230V). Depending on the hotrunner type, the output power is adjusted and displayed in the units "A" or "%".

The temperature control settings for the setpoint, increase and decrease values and operating mode (temperature control mode, controlled operation or zone inactive) are in the left-hand column, in the right-hand column according to the settings for the controlled operation.

The following procedure is recommended for entering the basic settings for the control system:

- Set the working voltage of the selected zone to 5V or 230 V. (This setting can only be made if the hotrunner is switched off).
- Enter the setpoint value for the temperature control, this mostly depends on the material used.
- Enter the increase value for the temperature control. This value equates to a 2nd setpoint value for the control circuit, in order e.g. to set a high temperature level for a brief time when starting up, for easier opening of the nozzles. The value entered is added to the setpoint value if the increase function is switched on. The increase function can be switched on and off using the user interface's function key or the signal input.
- Enter the decrease value for the temperature control. This value equates to a 3rd setpoint value for the control circuit, e.g. in order to set a lower temperature level for a brief time in case of malfunctions to avoid burning the material. The value entered is subtracted from the set-point value if the decrease function is switched on. The decrease function can be switched on and off using the user interface's function key or the digital signal input.
- Select temperature control or manual control mode as the type of operating more, the respective valid setting is identified at the end of the column with an "ON".
- Depending on the type of hotrunner connected, set the setpoint, increase and decrease values for the manual controlled operation (current at 5V; output at 230V).

The respective zone can either be entered directly (input marking must be position on the zone No.) or using the "Page UP" and "Page DOWN" keys.

A special function is available for the operator in order for them to be able to quickly enter the basic settings for new tools:

If the zone number "0" is entered, "**ALL**" appears as the display. The set values of the first zone are now displayed, however any changes made are transferred to ALL the zones. Thus, the basic settings for a tool can be quickly carried out. Furthermore, for example, uniform setpoint temperature changes can easily be made on all zones simultaneously during the running operation. Values deviating from the basic setting can then be made for the required specific zone.

When setting the operating mode, it must be noted that these changes also affect inactive zones. The changes to these values should therefore always be made with the hotrunner switched off or for specific zones.

ATTENTION: In the "ALL**" function the changes are also transferred to the inactive zones.**

In the single zone display, all the information about the zone status is available in the right-hand side of the main window.

If the access right "0" is set, the zone status is displayed both in symbol format (see explanation of symbols used) as well as in text format. In contrast to the multi-zone display, all problems that may exist are displayed here. If a higher access right is set the text display is replaced by additional zone adjustment possibilities, see section on "Normal operation, extended function" further on in these instructions.

Furthermore, the measured value of the output current can be read off, enabling the heat output used for the respective zone to be simply calculated.

Heat output $P = \text{Voltage } U \times \text{Current } I$ (whereby U equates to the mains voltage, e.g. usually 230V in Europe).

In this way, in 230 V mode the installed heat output (maximum value) can be determined, the momentary output is then calculated using the percentage output power.

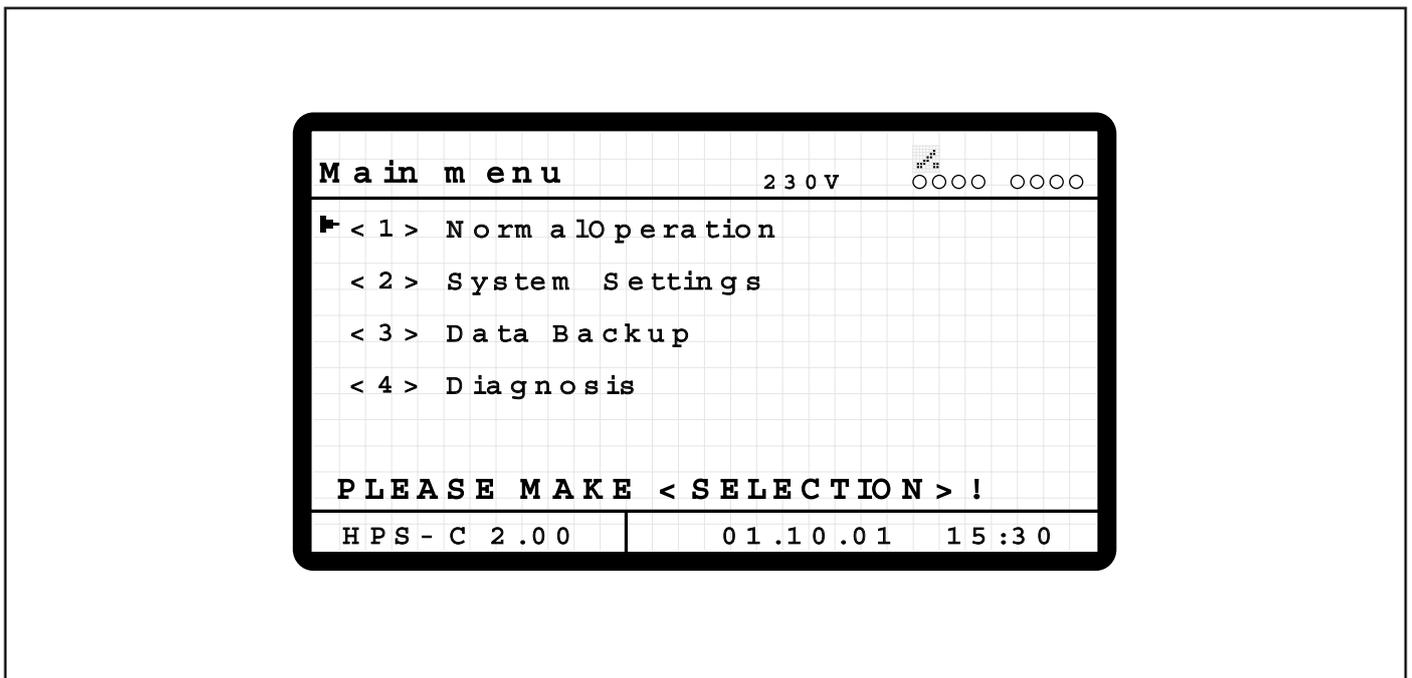
In 5V mode the current output power is determined using the aforementioned calculation.

Main menu

In addition to the normal operating functions, the HPS-C control system also enables you to switch additional functions on or off or to make adjustments. This means that the controller can be even better adjusted to meet the specific needs of the user or the connected hotrunner system.

Press the "ESC" key in the sub-menus to move to the main menu. The required menu item is selected using the cursor keys and by confirming the selection using the "ENTER" key or by directly selecting the figures.

For your information, the actuator software version is shown in the bottom left-hand side of the display, the following display can be seen:



The following possible adjustments or functions are available in the various sub-menus:

<1> Normal operation

This is the multi-zone or single-zone display of the zones already described in the previous chapter with the possibility of changing the most important process values. Further possible adjustments are described in a later Chapter "Normal operation, Extended functions".

<2> System data

In this menu, values can be changed and/or functions can be switched on or off, and which apply for all the zones in the whole control system. These include e.g. start up and monitoring functions as well as limiting values for the process. Access to the diverse possible adjustments is divided into various access levels, which are protected against unauthorised access by a password.

<3> Data backup

Here it is possible to save up to 4 different tool settings, to make this data available at a later point in time or to retain a basic setting found. Furthermore, you can manually trigger saving of the current controller settings or reinstate the works settings.

<4> Diagnosis

In this menu, the connected hotrunner system is checked for correct wiring and function of the heating and temperature sensor. To this end, all the connected activated zones are switched on one after the other and their performance is checked.

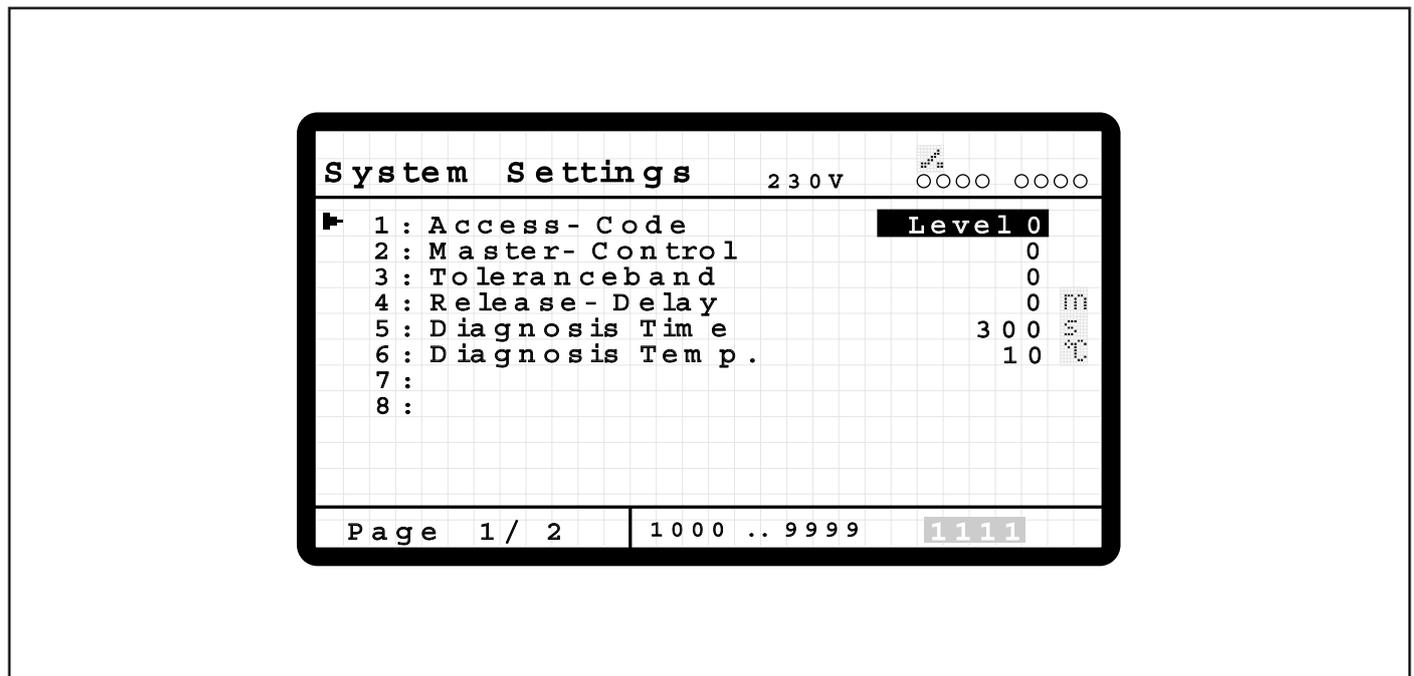
Further explanations of the various menus and the possible adjustments are given in the following chapters.

System settings

In the system data menu, values can be changed or functions switched on or off, which apply for all the zones in the whole control system. The access is divided into various authorisation levels, each of which is protected by a password. This means that the critical set values are protected against unauthorised access, a differentiation is made between 3 stages (Level 0 = operator, Level 1 = setter, Level 2 = manufacturer). The values are ordered page wise, use the "Tabulator" key to page to the next page.

Level 0, Normal access rights on starting the system:

In this access level all the actions required for normal operation of the hotrunner system can be made in the other menu items. The following function and value selection possibilities are available in the system data menu.



1: Access right (Preset: 0)

Enter the password to reach the various access levels. The currently valid access level is displayed. After 10 minutes without a key being pressed, the authorisation is automatically reset to "Level 0". Apart from in the system data menu, the access authorisation also affects the single zone normal operation display, this is described in the section "Normal operation, extended functions" at the end of the chapter.

ATTENTION: Adjustments can be made in the further access levels, some of which have serious effects on the operating performance of the control system. The values should therefore only be changed by expert personnel!

2: Master controller (Preset: 0)

If a temperature sensor fails, the zone concerned can be run with its own determined manipulated variable or the manipulated variable of a comparable zone, to keep production stoppages to a minimum. If the second variant is preferred, the "master controller" function must be switched on. The setting, which other zone is to take on the "reference function", is entered in the single zone normal operation display with "access level 1" and is described in a later section of this chapter.

3: Tolerance band monitoring function (Preset: 0)

The tolerance band function enables the injection moulding process to be automatically monitored for compliance with the given set values. Tolerance band windows can be entered for temperature and current control, these then apply for all the connected zones. The monitoring function can be used to trigger reciprocal actions in the data link with the injection moulding machine, e.g. decreasing the hotrunner in case of malfunctions in the machine or interruption of the injection operations in case of faults in the hotrunner system. However, to do this a link must also be installed between the controller and the machine, e.g. via the 24V signal cable, Art. No. 60070.017. Alternatively, or in addition, an optical or acoustic signal device can be connected at the 230 V signal connector. The assignments are described later in the chapter on "Connector and connection assignments". The tolerance band monitoring function is switched on using the setting "1".

4: Release delay time (Preset: 0 minutes)

This is used to set delayed switching off of an error message in case of tolerance band deviations, in order to allow the hotrunner system sufficient time to set up an adequately stable thermal condition following the heating period.

5: Diagnosis time (Preset: 300s)

Gives the maximum time during which each zone is available for functional tests during "Diagnosis" mode. Once this period has expired the zone check is terminated and the next zone is switched on. The "Diagnosis function" is described in more detail in the section of the same name later in this chapter.

6: Diagnosis temperature (Preset: 10°C)

Maximum temperature increase, which a zone has to reach in "Diagnosis" mode for analysis. Once this temperature increase has been exceeded the next zone is switched on (2nd criterion).

7: Not used

8: Not used

Parameter	Value	Unit
9: Temp.upperError	10	°C
10: Temp.upperWarn.	5	°C
11: Temp.lowerWarn.	5	°C
12: Temp.lowerError	10	°C
13: Curr.upperError	10	A
14: Curr.upperWarn.	5	A
15: Curr.lowerWarn.	5	A
16: Curr.lowerError	10	A

Page 2 / 2 0 .. 200 10 °C

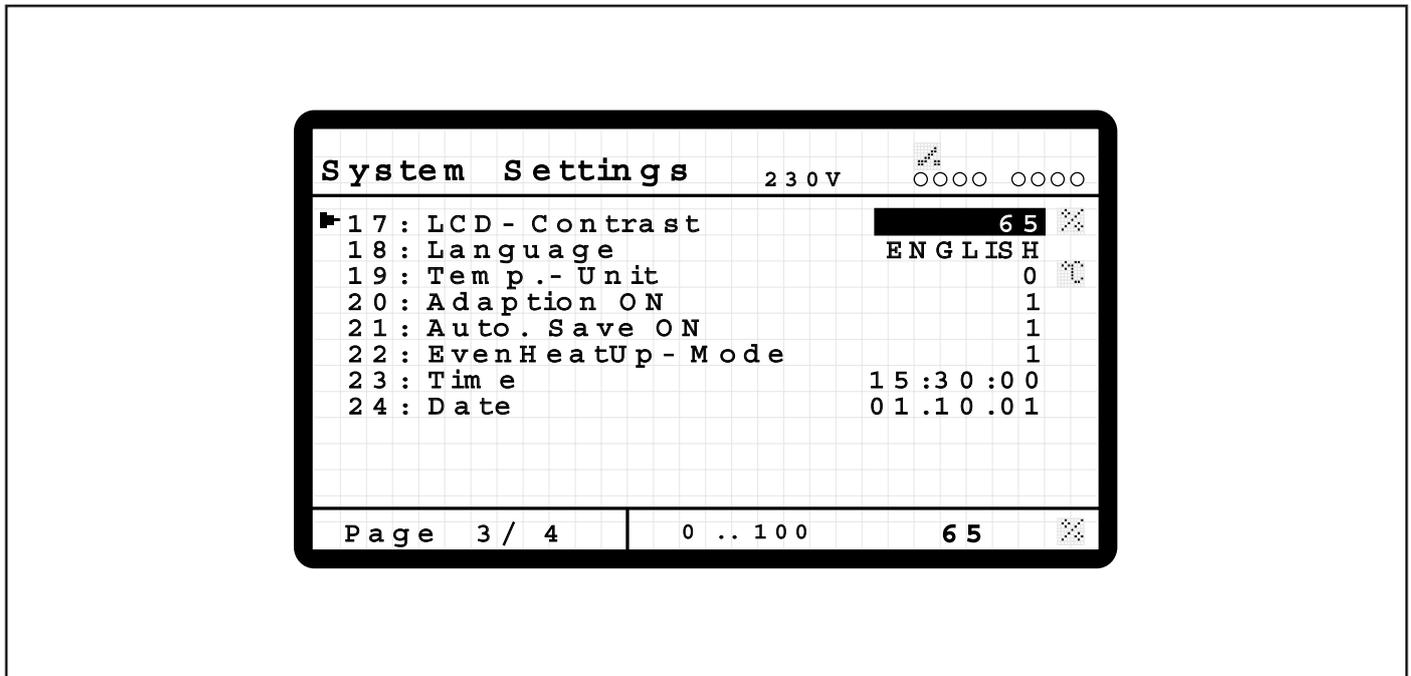
- 9: Tolerance band function: Upper temperature fault limit (Preset 10°C)
- 10: Tolerance band function: Upper temperature warning limit (Preset 5°C)
- 11: Tolerance band function: Lower temperature warning limit (Preset 5°C)
- 12: Tolerance band function: Lower temperature fault limit (Preset 10°C)
- 13: Tolerance band function: Upper current fault limit (Preset 10A)
- 14: Tolerance band function: Upper current warning limit (Preset 5A)
- 15: Tolerance band function: Lower current warning limit (Preset 5AC)
- 16: Tolerance band function: Lower current fault limit (Preset 10A)

Two pairs of values are available for temperature and current monitoring in the tolerance band function. The inner pair of values is intended for setting a warning limit if the process data only slightly deviates from the specified setpoint values. This enables any problems that occur to be identified in good time. The outer pair of values is used to generate error fault messages if the current process data deviates from the specified setpoint values by a large amount. The warning and fault messages are accessible via separate outputs on the controller.

The settings act relative to the setpoint value, i.e. for example for "Upper warning limit = 5°C" and "Lower warning limit =5°C" a warning message is issued if the deviation is $> \pm 5^{\circ}\text{C}$ from the setpoint value. This has the advantage that the limiting values do not have to be adjusted if the setpoint temperature is changed or if various zones have different settings.

Level 1, extended access right after entering password ("1111"):

After entering the valid password and pressing the "TAB" key, you reach the second page in the system data menu, in total, two additional pages can be selected in this access level.



17: LCD contrast (Preset: 65%)

Adjustment of contrast or brightness of the display. Irrespective of this setting, the display lighting is switched off if no key is pressed for 10 minutes, it is switched back on the next time a key is pressed.

18: Language (Preset: 0 = German)

Language setting for the actuator, the following are currently available: 0 = German 1 = English

19: Temperature unit (Preset: 0 = °C)

Setting the unit for the temperature display in the actuator: 0 = °C, 1 = °F

20: Adaption ON (Preset: 1)

The HPS-C control system is equipped with a self-optimising function, to optimally adjust the control performance to the connected heating load. This means that both extremely fast nozzles as well as slow manifolds can be precisely controlled. The necessary settings for the various types (PID parameter, see Section "Normal operation, extended functions") are stored in the controller, they are classified following the switching on process for the hotrunner system using the "/O"-key ("?" symbol in the system status display). To do this, a defined output power is given for the heating load for a certain duration, depending on the heating performance; the control parameters are then adapted to the controlled system.

However, the optimisation process is only carried out if all the temperatures of the hotrunner systems are below 100°C when the system is switched on. If this prerequisite does not exist, the last set values are used.

The "0" setting can be used to switch off the self-optimising function for certain applications.

21: Automatic save (Preset: 1)

Inputs or changes to the values are first stored in the volatile memory (RAM) of the controller module and are used as the current operating settings. This data is not saved to the non-volatile memory (EEPROM) until a save command is entered, where they are then available again even after a switching off or on process. During the saving process, a "Disc" symbol appears in the system status display, the increase and decrease LEDs of the controller modules flash alternately. During this period, the system does not accept any further inputs.

The values can only be saved when the hotrunner system is switched off, not while the control mode is running. The saving process can be triggered manually (see "Save/Load" section) or automatically following a switch off process ("/O" key), if the value "1" is set in the function. Parallel to this, all the values in the operating unit are also permanently saved, so that the last settings are not lost if there is a sudden voltage failure.

22: Interconnected operation (Preset: 1)

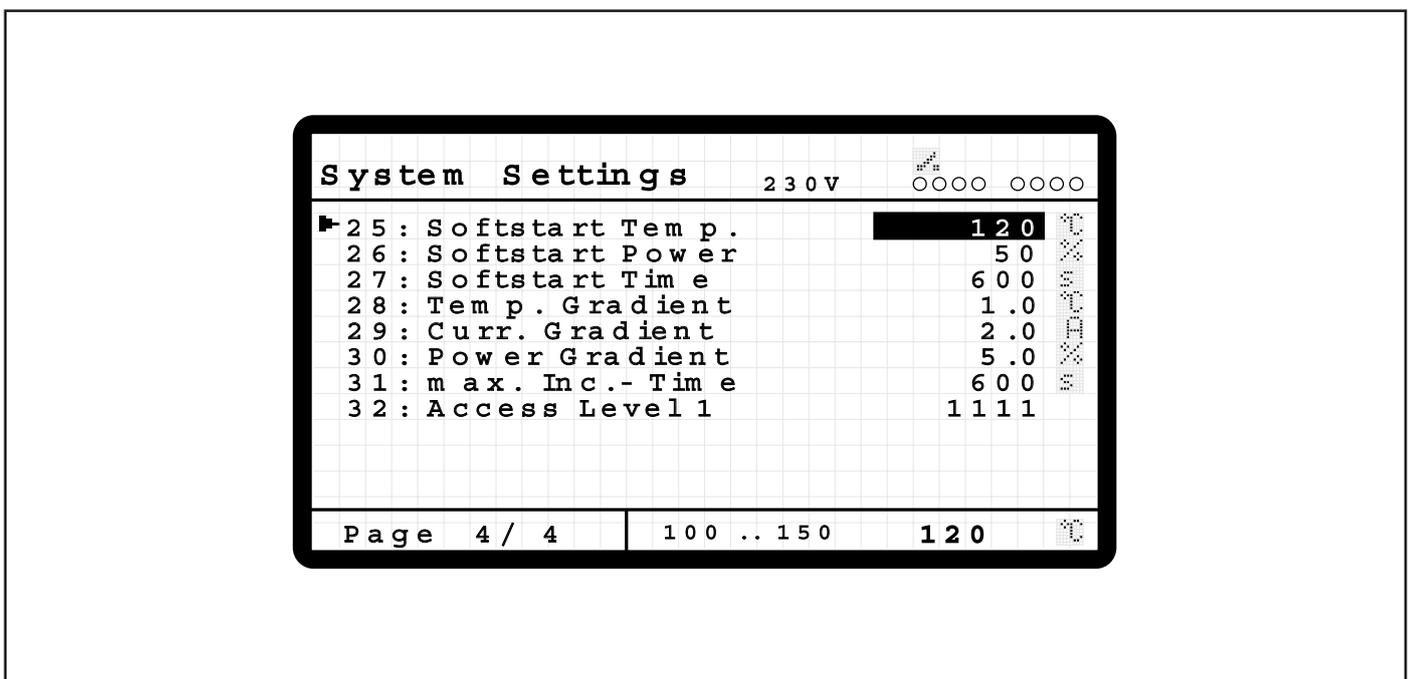
If this function is selected (Setting "1"), all the zones are heated with a uniform temperature level following the automatic start functions "self-optimisation" and "drying". During this phase the "Linear Diagram ()" symbol appears in the system status display (see "Legend"), furthermore, the current setpoint temperature value for all the zones is also displayed. This is calculated from the actual temperature of the coldest zone plus a supplement of 10°C. The even heat up mode function guarantees uniform heating of the system, so that in the normal case the faster nozzles does not reach its setpoint values long before the manifold zones.

23: Time

Setting the time in the operating case, presentation in "hh:mm:ss" format.

24: Date

Setting the date in the operating case, presentation in "DD.MM.YY" format.



25: Softstart temperature (Preset: 120°C)

26: Softstart power (Preset: 50%)

27: Softstart time (Preset: 600s)

In 230V heating, a drying phase (symbol: "inflected (knee joint) diagram"  in the system status display) is always run through following the switching on process, remove any residual moisture that may be present in the hotrunner system. Here the HPS-C control system works in phase angle control mode, to avoid damage to the connected heating loads. Compared to pulse package mode used in normal operation, smaller peak voltage values are switched to the heaters in phase angle control operations, so that sparkovers due to moisture are avoided. During the drying phase, all 230V heating is controlled with an adjustable maximum power (softstart power) for a minimum period (soft start time) at a maximum temperature (soft start temperature), after this, the set setpoint value is then started up.

The drying phase is prematurely stopped if:

- It is detected via the leakage current measurement that there is no moisture in the hotrunner system.
- All temperature values in the hotrunner system lay above 120°C when switched on.

28: Ramp temperature (Preset: 1.0°C/s; temperature control mode)

29: Ramp current (Preset: 2A/s; 5V operation manual mode)

30: Ramp percentage (Preset: 5%/s; 230V operation manual mode)

When switching on of the hotrunner systems or if changes are made to the setpoint values, the set ramp determines the slope or speed (change per second), with which the new setpoint value is started. This makes it possible to influence the heating speed of the hotrunner system. When setting, you must consider that for physical reasons, slow heating loads such as e.g. manifold, cannot achieve rapid changes in temperatures.

31: Maximum increase time (Preset: 600s)

The increase operation has a maximum time delimitation, to prevent damage to the material in the hotrunner system due to a permanently excessive temperature level. Following expiry of the set time the increase operations are automatically discontinued, if they are have not been previously terminated manually or via the external signal input. The maximum time delimiting function for the increase operation is switched off with the "0s" setting.

32: Access Level 1 (Preset: 1111)

The password for the first access level can be changed here to protect the control system from changes by unauthorised persons.

Level 2, Access rights for the manufacturer:

This authorisation is reserved for manufacturer changes, the possible adjustments are only given here for information purposes. Level 2 also contains all the functions possible in the first Level.

System Settings		230V	○○○○ ○○○○
33	: Lower Temp.Lim .	50	°C
34	: Upper Temp.Lim .	450	°C
35	: Lower Curr.Lim .	10	A
36	: Upper Curr.Lim .	125	A
37	: Lower PowerLim .	0	%
38	: Upper PowerLim .	100	%
39	: Max.- Current 5V	125.0	A
40	: Access Level 2	XXXX	

Page 5 / 5	50 .. 150	50	°C
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33: Lower temperature limit (Preset: 50°C)

34: Upper temperature limit (Preset: 450°C)

Set limits for the temperature setpoint value, to limit the range for critical materials if necessary.

35: Lower current limit (Preset: 10A)

36: Upper current limit (Preset: 125A)

Set limits for the current setpoint value in manual controlled 5V operations.

37: Lower percentage limit (Preset: 0%)

38: Upper percentage limit (Preset: 100%)

Set limits for the power setpoint value in manual controlled 230V operations.

39: Maximum current 5V (Preset: 125.0A)

Here the maximum current in 5V operations can be limited, e.g. to avoid damage in critical hotrunner systems. This setting is maintained by the controller as the upper limiting values during temperature controlled and current controlled operations, higher current values are not set.

40: Access Level 2 (Preset: ????)

Here the password for the second access level can be changed, to protect the control system from changes by unauthorised persons.

ATTENTION: If you forget the new password entered, access to this level is no longer possible!
The operating unit can then only be reset by EWIKON.

Data backup

It is possible to save 4 complete tool settings each with up to 40 zones in the actuator of the HPS-C control system. This means that the data is available at a later point in time, e.g. if the tool assignment or the basic settings of test tools are changed. Furthermore, the backup or save process for the current settings can be manually triggered in this menu, to save them in the EEPROM of the controller modules.

Data Backup 230V

No.	Name	Date	Com .:
1:	- SYSTEM -		S L C
2:	TOOL1865	25.09.01	S L C
3:	T	00.00.00	S L C
4:	CLEARED!	00.00.00	S L C
5:	CLEARED!	00.00.00	S L C

Command selection:
S = Save
L = Load
C = Clear (default setting)

Window for name input:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Q	R	S	T	U	V	W	X	Y	Z	(+	-	*	/)
0	1	2	3	4	5	6	7	8	9	.	CLR	END			

Page 1 / 1 .. z T

The commands "S" (Save), "L" (Load) and "C" (Delete or works settings) are available for backing up the data. The required command is selected using the cursor keys and triggered with the "ENTER" key.

The memory locations have the following assignment:

1: System memory location

Here, the current settings can be transferred to the non-volatile memory (EEPROM) of the controller modules ("S"), furthermore, the controller can be reset to its delivered condition ("C"). The Command "L" does not have any function here.

2-5: Free memory locations 2 - 5

In each memory location it is possible to save the current set data ("S"), to load the data stored there as the current setting ("L") or to delete the memory location or restore the works settings there ("C").

If memory locations are occupied (No. 2), the given name is in the title and the date of the last backup procedure continues to be displayed. If a renewed backup is made, the settings are overwritten and the backup date is updated, the name remains the same.

If a new memory location (No. 3) is used, an additional window appears after the backup command has been entered so that a name can be entered. The characters can be selected here using the cursor keys and accepted with the "ENTER" key. Up to 8 characters are available for the name. After the name has been entered, the naming process is concluded by selecting "END" or the backup procedure is aborted using the "ESC" key.

In the deleted memory locations (No. 4 and 5) the word "CLEARED" appears as the name, the date of the last backup is zeroed.

ATTENTION: For safety reasons, loading saved data as well as saving and deleting the current system data can only be carried out when the hotrunner-system is switched off.

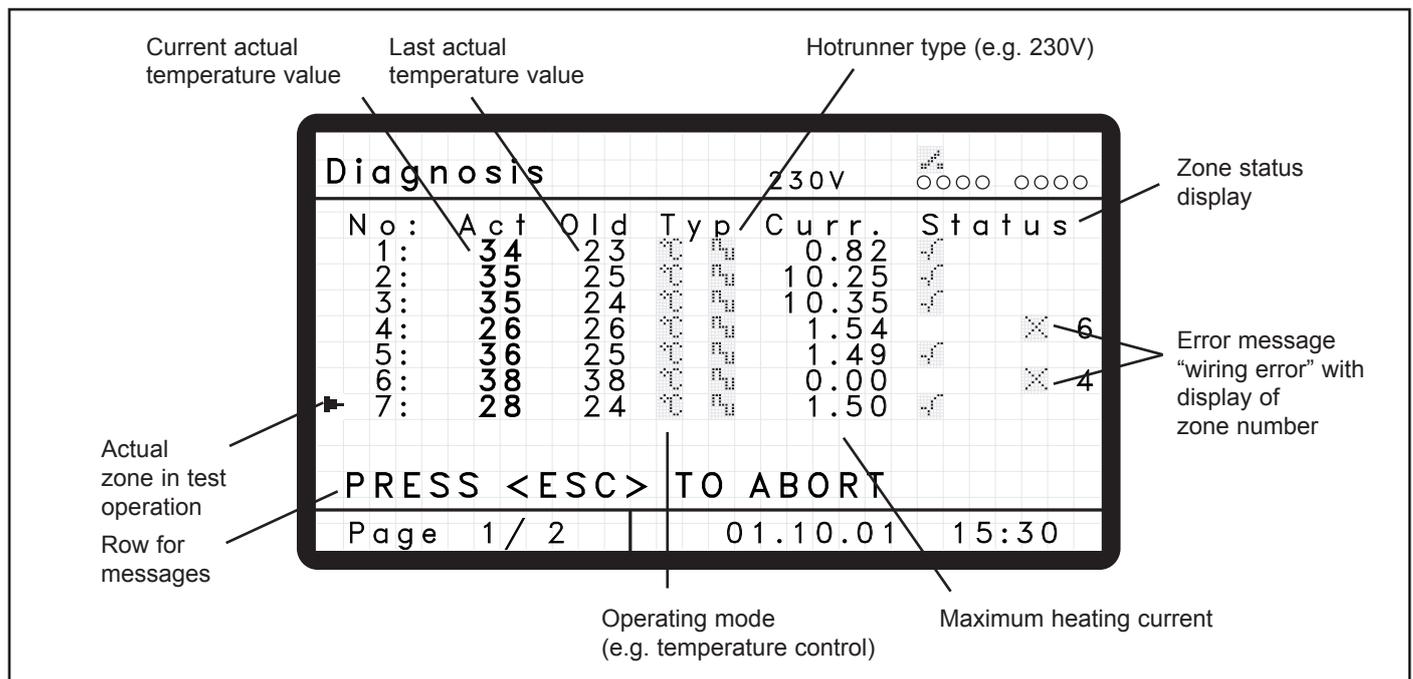
Diagnosis function

In diagnosis operations, all the active zones are switched on, one after the other, to be able to check that the hotrunner system has been correctly wired and is functioning properly. After selecting the menu, the operator receives the message

"START WITH <ENTER>"

to switch on the diagnosis operation. The sequence starts automatically after the "ENTER" key is pressed, this can be aborted using the "ESC" key or it ends after the last zone has been checked.

Depending of the hotrunner system connected, roughly the following display then results for running operations.



During the diagnosis sequence the zones are run individually, one after the other, with the current settings, inactive zones are skipped during the test. The valid settings for the type of operation (adjustment or control mode) and the type of hotrunner (5V or 230V)

are displayed for each zone. The cursor marks the respective current test zone.

When switched on, the last actual temperature value ("Old") is determined and displayed, during operation the respective current actual temperature value ("Act") is also displayed, so that changes can be observed.

The measured maximum current heating input and the zone status display are available as additional information for checking the performance (Heat output $P = U \cdot I$, whereby normally $U = 230V$). Any problems which occur are displayed here, the meaning of the symbols is described in the "Explanation of the symbols used" section and in the later "Error messages" chapter.

The following problems are identified in diagnosis mode, in addition to the controller's normal fault recognition:

- **Heat output too low ("Clock" symbol)**

The required temperature increase (System data menu, Parameter No. 6) was not reached during the prescribed diagnosis time (system data menu, Parameter No. 5). Possibly alter the setting or the start temperature is too high.

- **Insulation error ("Earth" symbol)**

The leakage current exceeds the set limiting value. Possible moisture in the system.

- **Wiring or assignment error ("Cross" symbol + zone number)**

The temperature sensor of another zone reacts to the heating of the current test zone, the zone concerned is displayed. Possible wiring error or the connection cables have been accidentally interchanged (i.e. Incorrectly connected).

After the diagnosis mode has been run through for all the zones,

"DIAGNOSIS FINISHED"

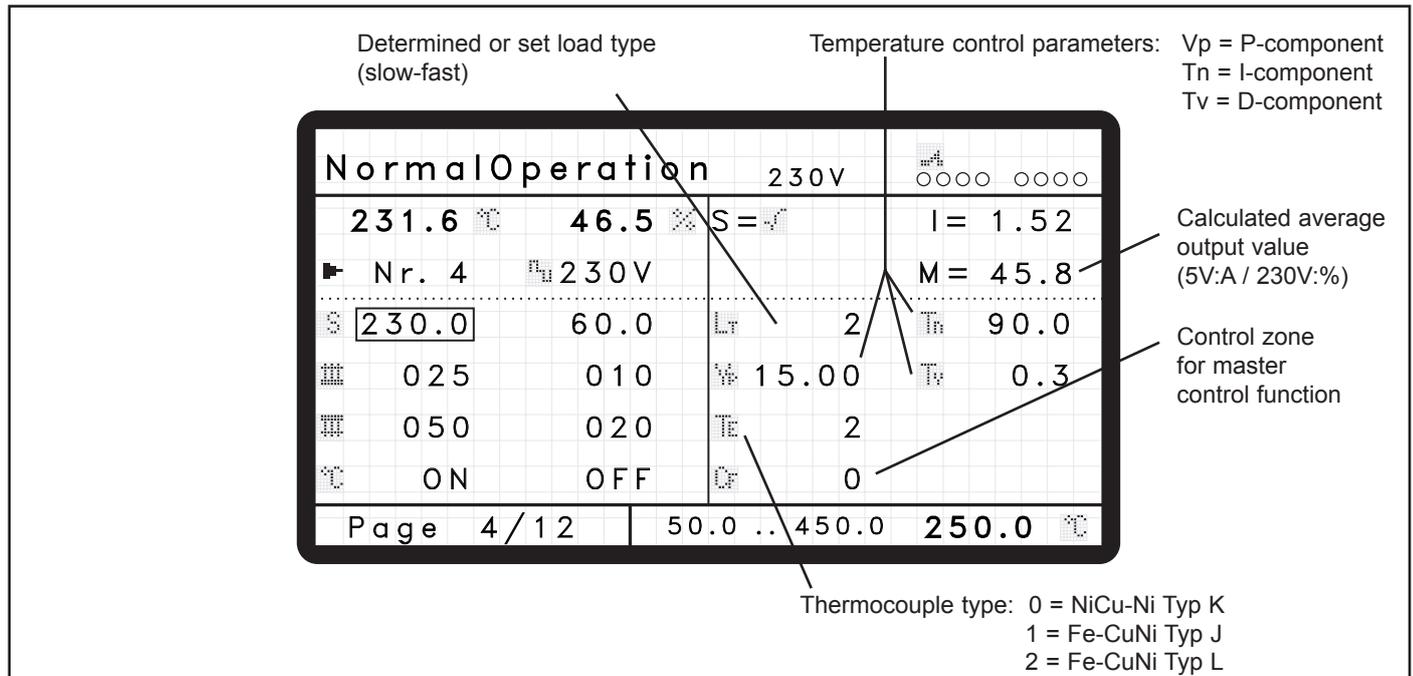
appears in the message line.

The "Tab" key can now be used to switch between the various pages of more than 8 zones. Return to the main menu by pressing the "ESC" key.

Normal operations, extended functions

Depending on the access right, further adjustments can be made in the single zone display, in addition to the zone information, to adjust the controller to special applications. As some of these values can have serious effects on the control and operational performance, changes should only be made by specialist personnel!

Level 1:



LT, Vp, Tn and Tv: temperature control parameters

The HPS-C control system is equipped with a PID control algorithm, which guarantees optimum control performance and small deviations between the actual and setpoint values during operations. During the system's heating up phase, additional supporting special functions also act (ramp, even heat up mode, ...), as the connected controlled system (hotrunner) mostly performs differently to the way it does in subsequent operations.

Load type is usually determined by the controller for each zone itself (see Chapter "System-settings", Set value 12: Adaption ON), and depends on the type of connected heating. In total, 10 different types are subdivided, for which certain controller presets are stored in the system. The following table gives reference values for the various settings, however the controller can contain deviating values:

Load type	hotrunner type	Vp (Amplifications)	Tn (reset time) / s	Tv (lead time) / s
0	230V, very slow performance	25.00	150.0	0.5
1	230V, slow performance	20.00	120.0	0.4
2	230V, average performance	15.00	90.0	0.3
3	230V, fast performance	0.00	60.0	0.2
4	230V, very fast performance	5.00	30.0	0.1
5	5V, very slow performance	1.10	60.0	6.4
6	5V, slow performance	1.05	48.0	6.4
7	5V, average performance	1.00	36.0	6.4
8	5V, fast performance	0,95	24.0	6.4
9	5V, very fast performance	0,90	12.0	6.4

If necessary, the control characteristics can also be adjusted manually, if a good control result is not achieved with the automatic detection. Either the load type can be changed, whereby settings recorded in the system are automatically used. Alternatively, it is also possible to individually adjust the 3 control parameters.

Vp amplification (Proportional component P):

The size of the output power set dependent on the system deviation depends on the amplification. Higher values means a larger output for the same deviation, lower values a corresponding smaller output.

The proportional component primarily acts during the start up of new setpoint values (large system deviation) and faults in the operations, and controls deviations as quickly as possible.

Reset time T_n (Integral component I):

The reset time depends on the capabilities of the connected heaters, with what speed the temperature can follow the changes to the output power. Slower heaters require a longer reset time; fast nozzles a correspondingly smaller time frame. The integral component keeps the control circuit at the required set temperature via a summed (integrated) output power, if there are no other system deviations.

Lead time T_v (Differential component D):

The lead time T_v counters changes and depends on how fast the actual value of the connected heaters change within a certain unit of time. Depending on the speed of the change in the actual value a larger or smaller dampening must be set, to prevent waves in the control circuit. The differential component primarily acts during rapid changes, e.g. malfunctions caused by the cycle due to the frictional heat input, and determines (differentiates) its output power from the change per unit of time.

The total output power for the control circuit is calculated from the 3 individual components P, I and D.

ATTENTION: The following items must be noted in case of manual intervention in the controls:

- Changes to the settings are not accepted by the controller unless the zone is switched off and back on or a write process was made on the zone activation (operating mode ON / OFF).
- The change in values should be made individually and in small steps, to be able to evaluate the results in a more differentiated way. Following each change the controller requires a certain period of time (approx. 5 - 10 minutes), to adjust to the new settings.
- Manual settings are only permanently retained if the value "Adaption ON" is set to "0" in the system data menu. If the setting is "1", the controller presets are reloaded each time the hotrunner system is switched on.

TE: thermocouple type

The temperature measurement of the HPS-C control devices is designed for connection to a thermocouple, in total, 3 different thermocouple types can be connected. When the devices are delivered the type Fe-CuNi "L" according to DIN 43710 is set, furthermore, the types Fe-CuNi "J" and NiCr-Ni "K" according to DIN IEC 584 can also be used.

The assignment of the setting and thermocouple type is listed in the following table:

Setting	Thermocouple	Type	Sheath colour*)	Plus leg*)	Minus leg*)
0	NiCr-Ni	K	green	Green	White
1	Fe-CuNi	J	black	Black	White
2	Fe-CuNi	L	blue	Red	Blue

*) Colour coding of the thermocouple connection cables, deviations are possible.

CF: Control zone

If the thermocouples in a hotrunner system fail, customers often wish to continue to run the zone with manual controlled operations, in order to keep production losses as low as possible.

In the HPS-C control system there are 3 different options:

- Controlled operation with manually input manipulated variables
- Controlled operations with an automatically calculated average output value, which has been determined from the last process values in control mode.
(Prerequisite: The controller must have run for at least 5 minutes within its setpoint value range)
- Controlled operations with an output value, which is transferred from another zone with the same performance (control zone)

After a thermocouple failure the controller first selects the second variant, to continue to maintain operations. If not enough time was available to calculate an average output value, e.g. after the heating process or changes to setpoint values, the output power is set as "0%" or "0A". Following acknowledgement of the error the operator can then decide whether this operating mode is to be retained or whether the first or third variant is prepared.

In variant 3 the controller must be informed from which other zone the output value is to be used. This zone No. is entered as the "control zone". It is important to ensure that the control zone and the zone affected with thermocouple faults normally have the same performance. Furthermore, the "master control" function must be set to "1" in the system data menu. Compared to the other variants, this one has the advantage that the zone is automatically controlled even if changes are made to the setpoint values and during increase or decrease processes.

Level 2:

In addition to the basic zone settings, adjustment possibilities are available here for 5V operation. Access via Level 2 is only accessible to the manufacturer, however the possible settings are given here for your information. Changes to these values must be undertaken very carefully, as the current control and current measurement react very sensitively at times.

Load type

Current control parameters: Vp = P-component
Tn = I-component
Tv = D-component

Normal Operation		230V	 ○○○○ ○○○○
231.6 °C	46.5 %	S=✓	I = 1.52
Nr. 4	230V		M = 45.8
\$ 230.0	60.0	Lr 2	Tn 6.0
025	010	0.40	Tv 6.4
050	020	10.0	→ 10.0
°C ON	OFF	100.0	→ 100.0
Page 4 / 12	50.0 .. 450.0	250.0 °C	

Adjustment current: lower measured value
upper measured value

Calculated average output value (5V:A / 230V:%)

Adjustment current:

lower calibration value

upper calibration value

Vp, Tn and Tv: parameters for the current-control

Apart from temperature control, the HPS-C control system has another current-control for the 5V operations, which also works as a PID controller. However, the control parameters are set the same for all the different load types, as no differentiation is required in the normal case.

Nevertheless, if necessary, manual changes can also be made here to the amplification Vp, the reset time Tn and the lead time Tv. The same adjustment rules then apply as those that must be observed for the temperature control.

The load type LT is only displayed for information purposes and should not be changed here.

, and : settings for adjust the current measurement

In certain cases it can be necessary to adjust the recording of the measured current values in 5V operations, e.g. if an 8V type is used instead of the transformer with 5V output voltage (in the case of high heating conductor resistances). Both the gradient and the level of the measuring range can be changed here, however a separate current measuring device must be available for adjustment (clip on ampere meter or multimeter with current probe) with appropriate accuracy.

The measured controller values are entered as the lower and upper measured values, which were read off at the lower and top point of the measured range. The values displayed at the same positions by the separate current measuring device are used as the lower and upper calibration values. In the normal case, these settings are carried out for 10A or 100A, so that the measuring accuracy is kept as low as possible over the whole working range.

ATTENTION: Changes to settings on this page are not reset by the "Reinstate works settings" command in the data storage menu!

24

EWIKON HPS-C Technical data

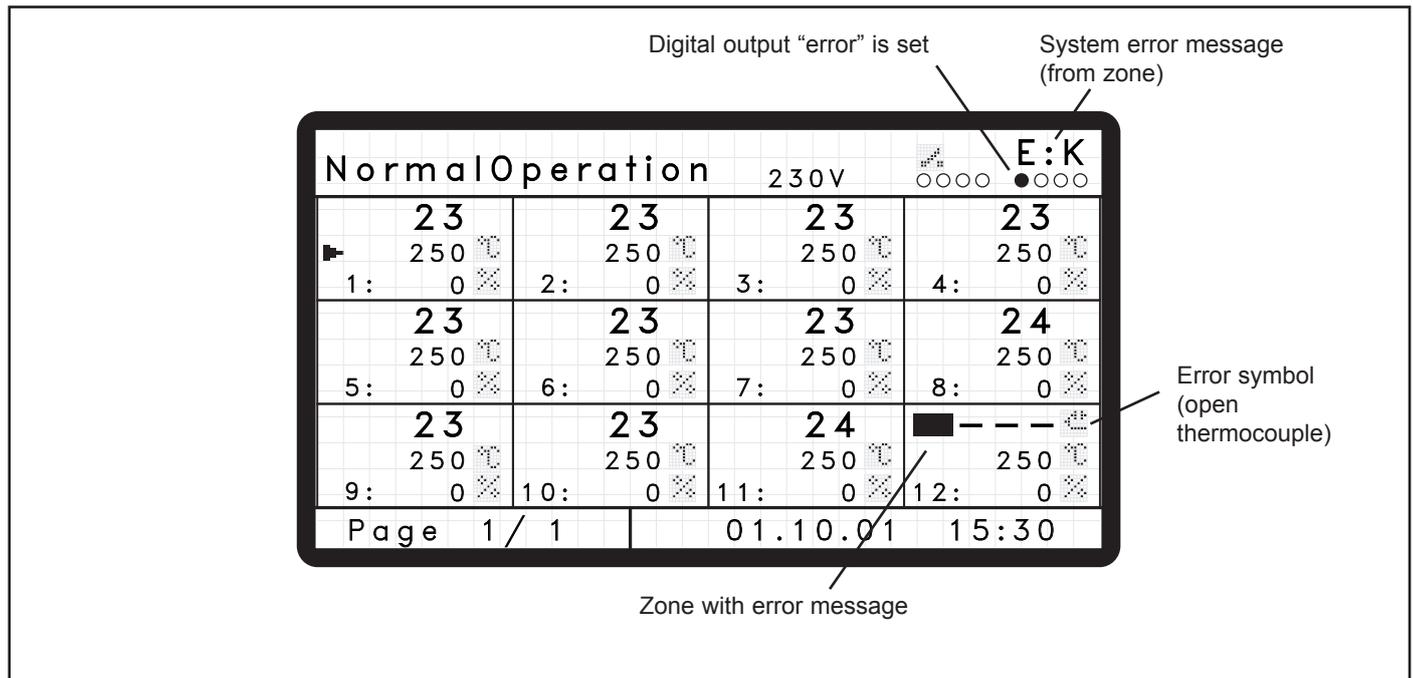
Operating voltage:	230V / 400V +6/-10%; 50 / 60 Hz
Degree of protection:	IP 33
Output power:	230 V: PMax: 2500 VA each zone or PMax: 3500 VA each zone 5 V: PMax: 625 VA each zone (dependent on transformer)
Output signal:	230 V: Phase angle control while drying out, Pulse package during normal operations 5 V: Phase control
Fuses:	- load circuit: G-fuse link 6.3 x 32 mm, Type A 12 BK (firm: Schurter) - F 12.5 A (for modules with normal output power) - F 16 A (for modules with output power 3.5 kW) - control circuit: G-fuse link 6,3 x 32 mm, F 6.3 A
Thermocouple inputs:	Fe-CuNi Type L or J; NiCr-Ni Type K
Signal input 24V:	External decrease, external increase, 2 free inputs
Signal output 24V:	Error message, warning message, system switched "ON", 1 free output
Signal output 230V (Optional):	Error messages, warning messages
Data storage:	EEPROM, data retained for at least 10 years
Interface:	CANopen
Ambient conditions:	Working temperature range: 0 - 50 °C
Control performance:	PID temperature control with adaptive parameter determination and possible manual optimisation
Control accuracy:	temperature-control: ± 1 °C current-control: ± 1 A
Start up functions:	- Intelligent drying operation with leakage current-measurement - setpoint value ramps with freely selectable increase - Even heat up of all the control zones
Measurement and working ranges:	- temperature: Range: 0 °C - 500 °C Resolution: 0.1 °C - current 5 V: Range: 0 A - 125 A Resolution: 0.1 A - current 230 V: Range: 0 A - 16 A Resolution: 0.01 A
Measurement accuracy:	- Temperature: ± 3 °C (at 300 °C) - Current 5 V: ± 3 A (bei 100 A)
Other functions:	- Load error detection short circuit, open circuit and partial load failure - Thermo error detection short circuit, open circuit or polarity reversal - Master controller operations for thermocouple failure - Setpoint value provision for thermocouple failure - Setpoint value monitoring with 2 tolerance bands for fault and warning messages - decrease function - Increase function with maximum time delimitation - Diagnosis function for tool commissioning - Possible storage for 4 tool-settings (operating unit)

Error messages

Apart from the normal operating functions, the HPS-C control system also has extensive monitoring functions, to detect problems and faults in the hotrunner system or in the controller in good time.

Faults or malfunctions are reported at the user interface in the system error display, when the hotrunner system is switched on (heating mode) the fault alarm output is set and the red LED next to the alarm acknowledgement key is switched on. If the error message is caused by a zone, this is displayed inverted in the overview display, in the zone status display the detected faults are shown in symbol form (the symbols apply equally in the zone status displays of the individual display and the diagnosis unction.).

The faulty module can be identified at the controller itself by the switched on "ERROR" LED.



The following list gives an overview of the various error messages and their meaning as well as possible causes.

System faults messages:

Signal/Message	Meaning	Possible cause
E:1	leakage current in system exceeds the set limiting value	Residual moisture in the hotrunner system due to lengthy storage; water entry
E:2	Network synchronisation measurement of the controller module is faulty	Fuse for the first zone of the mould concerned defective; malfunctions in the supply voltage
E:3	Internal faults in the controller module (communication faults)	Data transmission between the two controllers on the controller module is faulty, number of faults has exceeded the limiting value
E:4	Internal faults in the controller module (EEPROM fault)	Writing or reading error during access to the EEPROM memory of the controller module, possibly caused by voltage failure during writing process
E:K	Faults in one or several zones	Dependent on the type of error reported, detailed list in following section

Zone faults messages:

Message	Meaning	Possible cause
	tolerance band faults: upper malfunction limit exceeded	Severe malfunctions in cyclic operations; start of a new set value; sequential fault of a load circuit fault
	tolerance band-faults: upper warning limit exceeded	malfunctions in cyclic operations; start up of a new set value; sequential fault of a load circuit fault
	tolerance band-faults: lower warning limit exceeded	malfunctions in cyclic operations; start up of a new set value; sequential fault of a load circuit fault
	tolerance band-faults: lower malfunction limit exceeded	Severe malfunctions in cyclic operations; start up of a new set value; sequential fault of a load circuit fault
	thermocouple faults: open circuit	Thermocouple defective; plug in or screwed connection interrupted
	thermocouple-faults: short circuit	thermocouple defective; short circuit in the wiring
	thermocouple faults: Polarity reversal	thermocouple connected the wrong way round (Plus and minus legs reversed)
	load circuit faults: open circuit	Screwed connections interruption; fuse has tripped; interruption of the heating or the plug in or output
	load circuit faults: short circuit	Heating or wiring short circuit, e.g. due to penetra- tion of water; output controller (Triac) defective
	Load circuit faults: Partial open load	Failure of a heater in heating elements switched in parallel, e.g. manifold zones

The reaction of the control devices to the detected faults depends on their type, some only issue a message, others switch off the zone affected, and some even shut down the whole system.

Error messages are reset by pressing the alarm acknowledgement key or by switching off the zone affected or the whole hotrunner system. If the fault recurs or has not yet been corrected, the message is sent again.

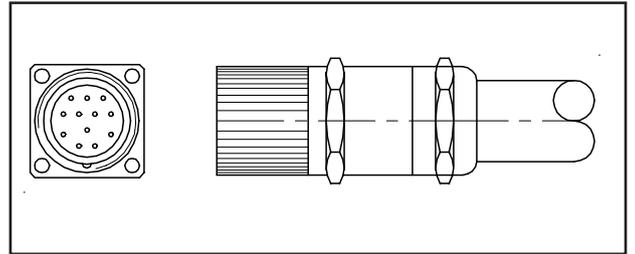
If fuses fail, the circuit breaker located in the controller may have tripped, in larger devices there may be several circuit breakers. The circuit breakers can be accessed by opening the housing cover.

ATTENTION: The controllers may only be opened by a qualified electrician after switching off the mains voltage or removing the mains connection plug!

Connector assignments

24 V DC Signal jack

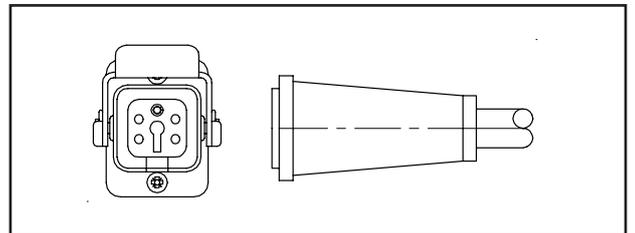
Contact/core	Title	Use
1	Input 1	Decreasing
2	Input 2	Decreasing
3	Input 3	Free
4	Input 4	Free
5	Output 1	Error message
6	Output 2	Warning message
7	Output 3	System switched "ON"
8	Output 4	Free
9	+ 24 V DC	Voltage supply
10	GND	for the inputs
11	-	-
12	PE	Protective conductor



Each output can be loaded with max. 200 mA, however, the total load of the connection plug must not exceed 0.5 A. All inputs and outputs work on the 24 V DC voltage level.

Signal-Buchse 230 V AC

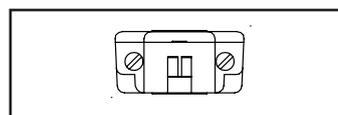
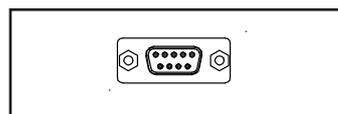
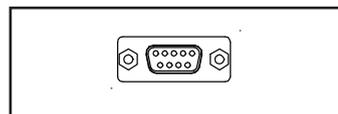
Contact	Use
1	230 V (via main switch)
2	Error message 230 V
3	Warning message 230 V
4	N
⊕	Protective connector



Each output can be loaded with max. 0.5 A, total load max. 1 A. The signals are directly available with a voltage level of 230 V AC.

CAN communications interface (Connector & jack)

Contact	Use
1	-
2	CAN_L
3	CAN_GND
4	-
5	-
6	24V GND *)
7	CAN_H
8	-
9	+24V DC *)

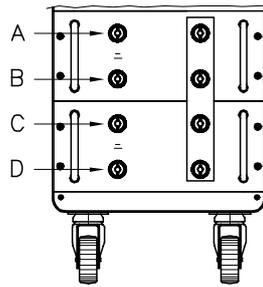


*) For operating unit voltage supply (max. 200 mA), only brought into contact by direct connection

Power units 5V

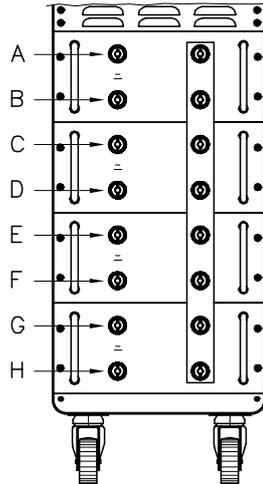
Circuit	Connection
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	I
10	J
11	K
12	L

68010.204



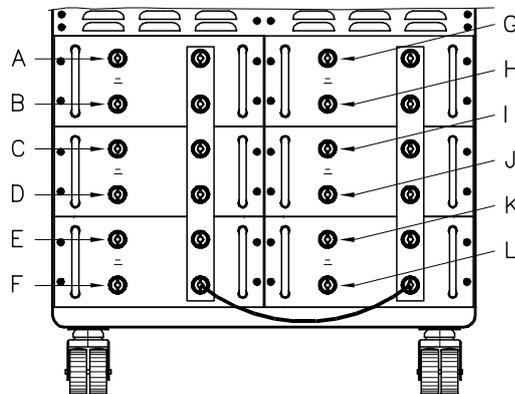
No: 61010.104

68010.208



No: 61010.108

68010.212



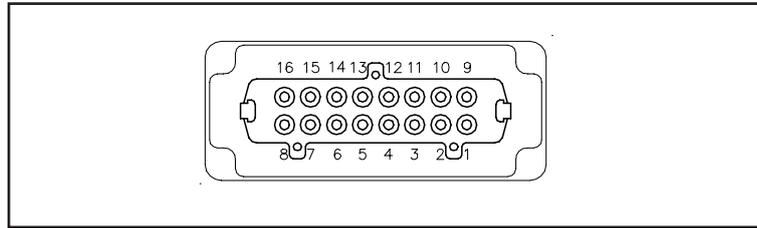
No: 61010.106

No: 61010.106

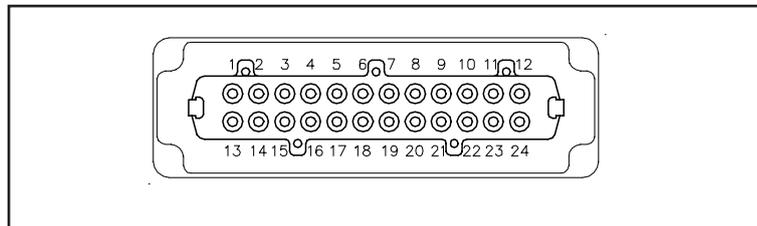
No: 61010.035

Connected load 230V

Circuit	Contact
1	1 + 9
2	2 + 10
3	3 + 11
4	4 + 12
5	5 + 13
6	6 + 14
7	7 + 15
8	8 + 16



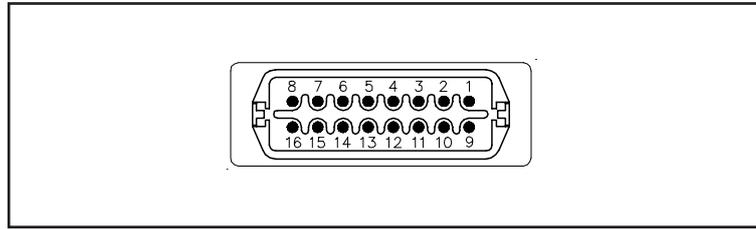
Circuit	Contact
1	1 + 13
2	2 + 14
3	3 + 15
4	4 + 16
5	5 + 17
6	6 + 18
7	7 + 19
8	8 + 20
9	9 + 21
10	10 + 22
11	11 + 23
12	12 + 24



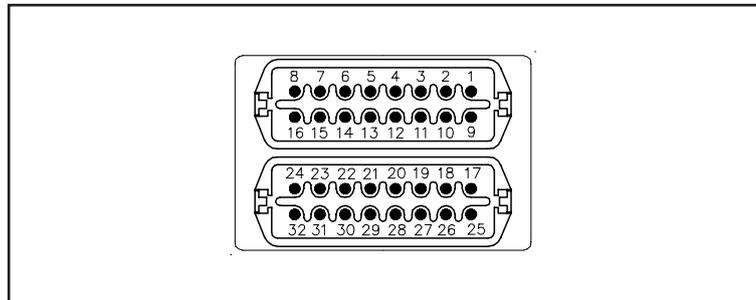
In controllers with a larger number of zones, the assignment of the other connectors is continued according to the assignment of the first connector (e.g. zone 13 for controller 68010.230 is carried out on contacts 1 + 13 of the second connector).

Thermo connection

Circuit	Contact	
	+ red	- blue
1	1	9
2	2	10
3	3	11
4	4	12
5	5	13
6	6	14
7	7	15
8	8	16



Circuit	Contact	
	+ red	- blue
1	1	9
2	2	10
3	3	11
4	4	12
5	5	13
6	6	14
7	7	15
8	8	16
9	17	25
10	18	26
11	19	27
12	20	28
13	21	29
14	22	30
15	23	31
16	24	32



In controllers with a larger number of zones, the assignment of the other connectors is continued according to the assignment of the first connector (e.g. zone 13 of controller 68010.230 is carried out on contacts 1 + 13 of the second connector).

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